

VARIABLE GRAVITY GAMING

CROSS REFERENCES TO RELATED APPLICATIONS

This application claims priority from prior copending U.S. provisional patent  
5 application number 60/484,552, filed July 2, 2003, and prior copending U.S.  
provisional patent application number 60/484,553, filed July 2, 2003. Both of such  
applications are incorporated herein by reference.

NO GOVERNMENT RIGHTS

10 No federally-sponsored research or development was involved with this  
application.

BACKGROUND OF THE INVENTION

Field of the Invention

15 The present invention relates to gaming and casinos, and more specifically to  
gaming devices and methods adapted for use in zero gravity, micro gravity, low  
gravity and variable gravity environments.

Discussion of Background Art

20 Casino gambling has been proliferating remarkably in recent years. In addition to  
traditional locations such as Las Vegas and Atlantic City, casinos have opened in  
non-traditional locations such as Native-American reservations, river boats and  
cruise ships. With so many choices, competition for customers is keen. Casinos  
are constantly looking for new environments and new attractions to increase  
25 business. See U.S. Patent No. 6,503,146.

The games of chance played in most casinos today are essentially the same.  
Casinos try to differentiate themselves through the atmosphere, location, gaming  
experience and amenities they offer. Therefore, a casino that offers both a novel  
30 gaming experience and novel games be attractive to both casino owners and  
casino patrons.

Until recently, human exploration of outer space has been the exclusive domain of nations. Spaceflight was so expensive and dangerous that only those people certified by their government as worthy to fly into space could do so. And not just  
5 any government was capable of this feat. To date, only the United States, Russia and China have successfully launched people into Earth orbit.

Since these launches are handled almost exclusively by government employees, there is little inclination to consider creating an environment conducive to either  
10 the travelers (Astronauts, Cosmonauts, Taikonauts) or for those on the ground. Therefore, there are no entertainment destinations or devices for space travelers.

The commercialization of the Russian space program has the potential to change this. To date, several "average" people have taken advantage of this new policy,  
15 including a Japanese reporter, a British lottery winner, an American businessman and a South African businessman. All have flown to space aboard a Russian Soyuz to either the Mir or International Space Stations. Their goals were not scientific but personal entertainment.

20 In addition, some suborbital flights have also been successfully undertaken by private firms, and press reports have indicated that commercialization of space travel will become more of a reality in the future. The recent successful flight of SpaceShipOne sent one person into outer space with more than 3 minutes of zero-gravity onboard a private vehicle.

25 It should not be too many more years before rides into space can be bought at quite reasonable rates from public or private organizations in a number of countries. Of course, reasonable rates for a rocket ride are quite a bit higher than rates for an ocean cruise. NASA is even funding preliminary research into building a space  
30 elevator that make getting into space rather trivial and inexpensive. There are some initial projections that claim such a device could be operational in less than a

dozen years.

Others have contemplated that space tourism could become commercially viable, and others have proposed special space habitats for tourists, such as in U.S. Patent  
5 No. 6,439,508, but gaming in space has not been discussed to date.

Thus, it seems clear that in the near future commercial travel to and from the unique environment of space will become available to a wide range of tourists. And where there are tourists there are casinos. It is expected that in the near future  
10 it will be possible to launch a space station designed specifically for tourists, costing approximately the same as building a traditional casino.

In addition, it is feasible today to rent or purchase space aboard an orbiting platform, such as a Russian Soyuz capsule. It is also possible, as of the filing date  
15 of this application, to actually purchase an entire Soyuz capsule and a launch vehicle and put into Earth orbit private businesses, including casinos offering games of chance adapted to be played in zero gravity or microgravity, the games adapted to be wagered upon either in person or via remote locations.

20 It is also possible today to buy a "ticket" onboard what are known as "zero-gravity" planes which allow the passenger to experience variable-gravity conditions, from zero-G to several Gs for sustained periods of time, long enough to play and wager at games of skill and chance.

## 25 BRIEF SUMMARY OF THE INVENTION

To meet the needs described above, it is an object of the present invention to replicate (and enhance) traditional casino experiences in zero gravity, microgravity, low gravity and variable gravity environments. This includes, but is not limited to, systems and methods for: (a) providing adapted "seating" for  
30 players and staff, namely positioning players and staff in relation to a gaming table or device; (b) enabling wagering both with traditional style casino chips and

methods more adapted for a variable gravity environment; and (c) ensuring security and integrity of the system.

5 A major difference between zero gravity gaming and variable gravity gaming is that, in variable gravity gaming, gravity forces may reach 2G or more temporarily, so that the players should be seated and preferably strapped down in their seats during periods of gravity forces greater than zero.

10 It is another object of the invention to provide games of chance for in-casino play, adapted for use in zero gravity, low gravity and variable gravity environments. This includes, but is not limited to, systems and methods for: (a) traditional casino games, such as craps, roulette and blackjack; and (b) new games of chance that take advantage of unique properties of zero, low or variable gravity environments.

15 It is another object of the invention to provide games of chance, either attended or unattended, adapted for operation in a zero, micro or variable gravity environment, and on which players can wager off-site, such as keno, roulette and lottery type games. This includes but is not limited to, systems and methods for: (a) playing a game of chance, such as keno, roulette and lottery, from a remote location; (b) 20 wagering from a remote location; and (c) maintaining security.

In one embodiment, the invention comprises a zero gravity casino comprising:

25 a chamber;  
games of chance housed within the chamber and adapted for being played in zero gravity, including means for enclosing game boards, playing objects and wagering tokens within enclosures to confine the objects and tokens within an enclosed space to prevent the objects and tokens from floating away;  
seating devices for positioning and holding players within playing distance 30 of the games of chance; and  
wagering devices for accepting and paying wagers from the players on the

games of chance.

In another embodiment, the invention comprises a casino chamber adapted for use in a zero gravity, micro gravity or variable gravity environment,

5 comprising:

a modular, sealed chamber adapted for being launched into space, adapted for operation in space, adapted for placement aboard an air or space vehicle, and adapted for accommodating gaming devices, game players and staff people;

10 gaming devices housed within the chamber and adapted to receive gaming objects and to prevent them from floating away;

devices within the chamber for positioning the game players and staff people at positions nearby the gaming devices; and

devices to accommodate wagering on the gaming devices.

15 In another embodiment, the invention comprises a game of chance adapted for use in a zero gravity, micro gravity or variable gravity environment, comprising:

a game environment having an enclosure and having internal positions representing winning and losing positions and adapted for receiving movable game 20 objects, and adapted to prevent the game objects from floating away;

means for randomizing the game objects;

means for introducing the game objects into the game environment;

means for randomly urging the game objects onto winning and losing positions within the game environment;

25 means for positioning players and staff people at playing positions adjacent to the game environment;

means for enabling players to wager on the game;

means for ending the game and for determining winners and losers; and

means for viewing the operation and results of the game.

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In another embodiment, the invention comprises a virtual game of chance

that simulates game play in a simulated zero gravity, micro gravity or variable gravity environment, comprising:

- a simulated game environment having a simulated enclosure and having simulated positions representing winning and losing positions and adapted for  
5 simulating the receipt and confinement of simulated movable game objects;
  - means for randomizing the simulated game objects;
  - means for introducing the simulated game objects into the game environment;
  - means for simulating the random urging of the simulated game objects onto  
10 winning and losing positions within the simulated game environment;
  - means for simulating players at simulated playing positions adjacent to the simulated game environment;
  - means for enabling players to wager on the game;
  - means for ending the game and for determining winning and losing wagers;
- 15 and
  - means for viewing the simulated game environment and operation and results of the game and simulated game objects.

- In another embodiment, the invention comprises a method for operating  
20 games of chance in a zero-gravity environment, comprising the steps of:
- providing an enclosed transparent chamber having a gaming board and adapted to receive gaming objects, the chamber adapted to prevent the objects from floating away in zero gravity;
  - accepting wagers from players on the gaming objects;
  - 25 introducing the gaming objects into the chamber to start a game;
  - randomizing the gaming objects;
  - causing the gaming objects to cease motion so as to end the game;
  - viewing all activity within the chamber; and
  - determining one or more winning and/or losing wagers.

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In another embodiment, the invention comprises a method for operating a

game of skill in a zero-gravity environment, comprising the steps of:

providing an enclosed transparent chamber having a playing board and adapted to receive playing objects, the chamber adapted to prevent the objects from floating away in zero gravity;

- 5        accepting wagers from players;  
starting a game of skill by introducing a playing object into the chamber;  
viewing all activity within the chamber; and  
determining one or more winning and/or losing players.

- 10        In another embodiment, the invention comprises a method of confining, randomizing and controlling moving objects in a zero-gravity environment, comprising:

providing an enclosed chamber having an irregular inner surface;  
introducing magnetic objects into the chamber;

- 15        randomizing motions of the objects within the chamber by directing jets of air at the objects at random times; and  
stopping the motion of the objects by introducing an electromagnetic field within the chamber at a random time.

## 20        BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings; which are incorporated in and constitute a part of this specification, illustrate the invention and, together with the description, explain the invention. In the drawings:

- 25        FIG. 1 is a perspective view of a casino chamber containing several games of chance, the chamber adapted for use in a zero, micro or variable gravity environment;

- 30        FIG. 2 is a perspective view of a craps gaming table adapted for use in a zero, micro or variable gravity environment;

FIG. 3 is a perspective view of a lottery gaming device adapted for use in a zero, micro or variable gravity environment;

- 5 FIG. 4 is a perspective view of a roulette gaming table and wheel adapted for use in a zero, micro or variable gravity environment;

FIG. 5 is a perspective view of a keno gaming device adapted for use in a zero, micro or variable gravity environment;

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FIG. 6 is a block diagram of a device adapted for use in playing a dice game such as craps in a zero, micro or variable gravity environment;

- 15 FIG. 7 is a perspective view of a device adapted for use in playing a game called "Byte" in a zero, micro or variable gravity environment;

FIG. 8 is a block diagram of a device adapted for use in playing a lottery game in a zero, micro or variable gravity environment;

- 20 FIG. 9 is a perspective view of a device adapted for use in playing a game called "Sixteen" in a zero, micro or variable gravity environment; and

FIG. 10 is a perspective view of a device adapted for use in playing a game called "Space Pool" in a zero, micro or variable gravity environment.

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## DETAILED DESCRIPTION OF THE INVENTION

### Definitions

The following definitions are presented to assist in understanding the current invention, without limiting the scope of the invention:

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Casino -- A place or environment in which systems, methods and devices relating



to games of chance are operated. A casino is not necessarily a physical location that a customer must travel to wager.

Gravity – The gravitational force exerted by the Earth at sea level.

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Microgravity -- A location or environment where the gravity force, either real or simulated, is significantly less than that experienced on Earth at sea level.

Low Gravity -- A location or environment where the gravity force, real or  
10 simulated, is less than that experienced on Earth at sea level, but not zero.

Zero Gravity (“zero-G” or “0G”) -- A location or environment where the gravity force, real or simulated, can be measured at or near zero.

15 Variable Gravity – A gravity force or simulated gravity force that is not constant over time.

End of Game – The moment in time where it is determined that the play of a game of chance has ended.

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Casino Chamber

FIG. 1 is a perspective view of a casino chamber in one embodiment of the invention, containing several games of chance, the chamber adapted for use in a zero, micro or variable gravity environment. This figure shows a casino chamber  
25 prepared for installation in an orbital space station or vehicle, suborbital vehicle, or parabolic airplane. It shows several different games 1, 2, 3, 4 housed within the chamber and mounted to the chamber “floor” or “wall” 5. Hand rails 6 are provided along the walls 5 and the walls are padded. Some games also have chairs or stools 7 with footholds or foot restraints 8 that a player may use to keep from  
30 floating away.

### Variable Gravity Game Devices

Traditional casino game of chance devices have been modified for a variable gravity environment, and new games of chance have been developed that take advantage of zero, micro and variable gravity environments.

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#### Traditional Casino Game Devices in a Variable Gravity Environment.

Craps and other dice games.

In a traditional casino, craps is played on a table with high sides. The guest that is throwing the dice (the shooter) stands at the narrow end of the table and throws the die to the far side. If a die leaves the table it is rerolled. When the dice stop the faces pointing up are the ones counted. Therefore, the goals of the present invention are to create a device that: (a) allows all players seated in a variable gravity environment a means to roll the dice; (b) constrains the dice to a predetermined area; and (c) ensures that a die roll produces a random number adapted for games of chance.

15

In light of these goals, the following embodiment of the invention discusses one device. However one skilled in the art recognize that there are numerous other ways to create a device that achieves these goals. A device to play dice games such as craps is shown in FIG. 2. This consists of four broad components; a throwing container, a randomizing device, a playing and viewing area, and means to stop the dice rolling.

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#### Throwing.

In one embodiment, a hinged tube 25 is attached to a randomizing chamber 30 mounted to a transparent cover 20 and adjacent to a craps table 10. This tube is hinged so that it can be moved in front of any guest at the variable gravity craps table. The tube is expandable in length to comfortably reach all guests playing variable gravity craps by a method such as having two nested tubes. One tube is able to move forward and backward to create a throwing tube of the required size. In another embodiment a mechanical means secures the tube once a length has

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been selected. In another embodiment, the throwing tube 25 has a means to detect when dice 15 have been "rolled," such as a motion sensor (not shown).

Randomizing.

5 In a traditional casino with normal gravity, dice are randomized by hitting the back wall of a table, then rolling on a surface with high friction. Bumps and other physical obstacles are placed in the throwing tube. As shown in FIG. 2, the throwing tube 25 leads to a randomizer 30 and a randomizing/ viewing chamber or enclosure 20. If the dice do not successfully leave the randomizer, there is a reroll,  
10 just as if the dice hit the floor in a traditional casino.

As shown in FIG. 6, the randomizing chamber includes a throwing area 115, a randomizer 120, a viewing enclosure 130 and an electromagnet 140 or other device to stop the dice from moving at the end of play. Other components (not shown)  
15 include a one way entrance, a one way exit, and a means to make the dice exit the randomizing chamber. The randomizing chamber is a round revolving or stationary transparent globe, or cylindrical or other shape transparent cover 20, with various obstructions or irregularities (not shown) on the interior surface designed to flip the dice. In addition some means to make the dice interact with the  
20 globe or chamber is necessary in 0G flight, such as compressed air forcing the dice against the sides of the globe. Compressed air is used as the method to force the dice to exit the randomizing chamber. A combination of gravity and compressed air force the dice to exit the randomizing chamber into the viewing area.

25 Viewing Area.

The viewing area is either a full transparent globe or enclosure 20, or a small diameter transparent tube, flattened at the bottom and positioned at eye level of the guests. The objective is to have the viewing area visible to all guests and to have the dice interact with the viewing area, perhaps by bouncing side-to-side, during  
30 both 0G and 1G play. Guests may participate in or watch the game from stools or playing stations 36. Guests may use seat belts, shoulder belts, hand holds, foot

holds or Velcro patches to stay in position in zero gravity.

#### Ending Game

Ending a game of chance requires a means for providing a fair end of game event.

- 5 In a traditional casino, a game such as craps ends when gravity and friction have stopped the movement of dice. For some games in a zero, micro or variable gravity environment, the game must be stopped by artificial methods, such as a plane's flight path or by activating an electromagnet 140 (FIG. 6), air jet, vacuum or other restraining force in a randomized way.

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- In a traditional casino, friction eventually stops the roll of the dice and the side facing "up" is used for determining winning and losing game positions. In a 0G environment, or due to variations in flight path, there needs to be a way to end the game with the dice positioned in a fixed manner. In other words, there needs to be
- 15 a fair way to determine when the "end of game" is. As discussed above, the throwing tube has a sensor (not shown) to detect when dice are put into play. One embodiment is to use dice with a metal component, such as a ball bearing in them. At end of game, an electromagnet 140 at the bottom of the viewing area turns on, or suction, forces the dice to the "floor" of the viewing area and holds them there.
- 20 The electromagnet or suction is turned on "x" seconds after dice are put into play. A display, such as an LCD panel (not shown) may be used to show guests a countdown to end of play.

- In another embodiment, in a variable gravity environment, the end of game event is
- 25 accomplished by the re-introduction of gravity. For example, the parabolic plane pulls up.

- It is not necessary for an "end of game" event in a game of chance to be "manned" or accompanied by a live person physically present in the gaming environment, as
- 30 long as proper playing procedure, wagering events and security are maintained.

## Roulette.

An example of a roulette gaming device adapted for use in zero gravity, micro gravity or variable gravity is shown in FIG. 4. In a traditional casino, the roulette ball bounces in and out of pockets in a roulette wheel 52 until the ball's motion is slowed down by friction and it settles into a pocket. To adapt a traditional roulette wheel to a 0G environment requires three components; a means for introducing a roulette ball to the wheel, a means to keep the ball constrained during 0G or variations in gravity, and a method for ending the game. A simple transparent cover 54 serves to keep the roulette ball in play. A tube (not shown) with a one-way exit through the transparent cover serves to introduce the ball to play. Players may place wagers on a table 50 next to the wheel.

In 0G there needs to be a method to force the ball to interact with the pockets and to position the ball at end of game. One embodiment of the current invention has an opening at the bottom of the roulette wheel pockets. The pockets rotate above an open track that is attached to an air pump (not shown). Thusly the roulette ball is forced to interact with the roulette pockets due to suction. The suction may be continuously increased as the game progresses, thereby ensuring the ball stops and stays in a pocket regardless of 0G or variations in flight.

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Attention is again directed to FIG. 4. Like craps, roulette is a social game. Traditionally, players stand on two sides of a billiards size table and place bets on a communal betting area. A dealer stands to one side and operates the roulette wheel. In a variable gravity environment this needs to be modified. One embodiment of the current invention follows.

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A standard-style roulette wheel 52 with a clear plastic bubble 54 over it is mounted on a gimble so that it remains horizontal to gravity or to the players' lines of sight. Another embodiment has the entire roulette area, chairs and roulette wheel mounted on a gimble so a player's view of the roulette wheel does not change during different flight paths. In one embodiment, guests and game operators are

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seated in chairs 56 facing forward. These chairs, as discussed above, may move back during 0G to allow a guest to float while playing and move back in place prior to 2G flight. The chairs also have seat belts 58 to hold players in during play in zero gravity.

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As an alternative to chairs, foot straps, hand straps or Velcro pads on the wall/floor may be provided for the players and game operators. Chips (discussed below) are permanently magnetized or "Velcro-ized" to stick to the table, and the ball is temporarily magnetizable to pull it into a slot. The ball is launched into the  
10 bubble by a pinball-type spring & plunger (not shown), or by hand through a tube or door. Air jets inside randomize the movement of the ball and blow it down toward the wheel in preparation for magnetizing the wheel at a random time.

Lottery.

15 Attention is now directed to FIGS. 3 and 8. A device 300 to pick lottery numbers in a 0G environment has the following components: a means such as a holding container 310 (FIG. 8) to display the available lottery balls before play, a one way entrance 320 to a randomizing chamber, a randomizing chamber 330, a one way exit 340 from a randomizing chamber, and a display means 350 to display winning  
20 lottery balls. In a traditional lottery type game, numbered lottery balls are displayed before the start of the game in order to demonstrate the game is fair. This can be accomplished by a simple device, such as a transparent tube.

At the start of the game, the balls are forced from a display tube to a randomizing  
25 chamber 330 by forced air through a one way entrance. Preferably, the randomizing chamber is a fixed or rotating transparent cylinder or globe, supported on its horizontal axis. Various length transparent spikes (not shown) are mounted on the interior of the globe and are designed to interact with the lottery balls to randomize them. In another embodiment, these spikes may be hollow and have a  
30 means to have compressed air flow through them for the purpose of making the globe or cylinder spin and creating air currents inside the globe for the purpose of

randomization.

In another embodiment, the randomizing chamber starts in a locked configuration. When sensors (not shown) determine that the correct number of lottery balls have entered the randomizing chamber, an indication is given and the chamber is  
5 unlocked. At this point, a host or other individual gives the randomizing chamber a spin to start the randomizing process. When a preset randomizing period has ended, one or more balls are selected by having a random ball go through the one-way exit from the randomizing chamber. Air pressure is used to force balls through  
10 the one-way exit. A simple device, such as a transparent tube is used to display the winning lottery balls.

In an alternative embodiment, a zero gravity lottery need not use traditional balls during a drawing. For example, weights with numbers may be used instead, or a  
15 pre-set pattern of colors may be used to represent traditional balls.

#### Keno

A keno gaming device adapted for use in zero gravity, micro gravity and variable gravity is shown in FIG. 5. The device includes a game board 70, a transparent  
20 chamber 75 for holding game balls or other objects, and a transparent tube 78 for displaying winning balls. Balls are randomized in the chamber using air jets. Irregular surfaces on the inside of the chamber also increase randomness as the balls “bounce around” inside the chamber. In this illustration, note that the entire game device is mounted on a “wall” 71. As is known, in zero gravity, any inside  
25 surface of a casino chamber may function as a “floor,” depending upon the orientation of the players in relation to the surface.

#### New Casino Games and Game Devices

In addition to modifying traditional casino games for a zero gravity, micro gravity  
30 and variable gravity environments, a variable gravity casino can be enhanced by having games of chance that use the unique property of variable gravity (or zero or

micro gravity). The present invention illustrates new games of chance for these environments, namely games that are called Byte, Sixteen and Space Pool. One skilled in the art may realize that there are many other games that are adapted for a variable gravity environment. The goals of the following games are to: make use of  
5 a variable gravity environment, in particular a period of 0G flight followed by 1+G flight, or a totally zero-G flight, and be visually interesting.

#### Byte Game

This game is shown in FIG. 7. The method of play is as follows. Eight colored  
10 balls 205, perhaps white, or of different weight and eight differently colored balls, perhaps black and white are set into play. At the end of play eight balls are randomly selected. The game device positions these randomly selected balls in a line of holes 220. Guests are able to place a variety of bets, including but not limited to: (a) the eight bit pattern, or letter in "computereze," the results form,  
15 (b) whether there are more balls of one color chosen, (c) whether there are four balls of each color chosen, and (d) whether there are more black colored balls in the first four slots then the second four slots.

Just as a roulette wheel has a green 0 to give the casino a winning edge, it may be  
20 advantageous that Byte has some combinations of results that cause any bet to be lost, such as all of one color.

One embodiment of a device to play Byte is as follows. The device has an enclosure with a transparent cover 215, a method of putting the balls into play, and  
25 a method of choosing the winning balls. The enclosure is transparent. The top and sides are uneven, perhaps dimpled. The bottom of the enclosure is a "V" shape. At the bottom of the "V" are eight holes 220 smaller than the balls.

Upon the start of 0G, air pressure from these holes blowing from a source (not  
30 shown) outside the chamber toward the inside of the chamber put the balls in play. As the original eight balls are moved off the holes, the "V" shape drops the others



into place and air pressure puts them in play. The balls bounce off the uneven enclosure and each other to create a random distribution. At the end of play, such as at the start of 1+ G, air pressure is reversed (a vacuum is applied to the holes), so that balls are held into the holes at the bottom of the enclosure through suction.

5 Once all eight holes are filled, the bottom of the enclosure that forms a "V" drops down to form an inverted "V" with just the winning balls up top.

#### Sixteen Game

See FIG. 9. In this game adapted for zero gravity, micro gravity and variable

10 gravity, the method of play is as follows. Sixteen balls are put into play, eight of one color and eight of another. At the end of play, the balls are randomly arranged in a four by four grid. Guest are able to place a variety of bets, including but not limited to: (a) the entire pattern, (b) any one column or row, (c) the pattern of the center four balls, and (d) whether there is more of a certain number of one color

15 balls in the top two rows then the bottom two.

The sixteen game also has an advantage in that it may be played and organized by traditional lottery organizations since the method of game play is similar to traditional lottery.

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Just as a roulette wheel has a green 0 to give the casino a winning edge, it may be advantageous that Sixteen has some combinations of results that cause any bet to be lost, such as all of one color.

25 One embodiment of a device to play Sixteen is shown in FIG. 9. The device has an enclosure 110, a method of putting balls into play, and a method of choosing the winning balls. The enclosure is transparent. Inside top and side surfaces are uneven, perhaps dimpled. The bottom of the enclosure is composed of sixteen pockets arranged in a four by four grid. At the bottom of each pocket is a hole 290

30 smaller than the balls. At the start of 0G flight, air pressure from these holes puts the balls into play. The balls bounce off the uneven enclosure and each other to

create a random distribution. At the end of play, such as at the start of 1+G, air pressure is reversed, so that balls are held into the holes at the bottom of the enclosure through suction. Once all sixteen holes are filled the game is over.

- 5 The Sixteen game need not be physically attended by people. One embodiment of an unattended device to play Sixteen is shown in FIG. 9. The device has an enclosure for balls 110, a mounting bracket 240, a means of electrical power 215, a means to communicate including an antenna connection 225, a means to detect tampering such as a sensor 260, a means to display the game to an observer at a
- 10 remote location such as a camera 270 aimed toward a transparent "porthole" 250, a means of putting the balls into play, a means of choosing the winning balls, and a means of time synching with a remote location. The goal of this device is to provide a unique experience for individuals who wager on games of chance. The sight of the game's sixteen balls floating and interacting in micro gravity is what
- 15 makes this device unique.

#### Game Enclosure.

- The device is sealed inside an enclosure 110 adapted for the stresses of shipping to remote locations and liftoff into orbit. The enclosure may have a means of
- 20 connecting to an exterior electrical system 215, and/or a means of connecting to an exterior antenna 225, and/or a means of connecting to an exterior air or gas source 235.

#### Anti-Tampering.

- 25 The enclosure has sensors 260, which detect if the enclosure has been opened. This detects and deters efforts to "rig" the device. When queried the device transmits a log of sensor data. All communications to and from the device are encoded or encrypted, and include time stamps.

#### 30 Display.

Ideally, the device has a transparent section of the enclosure which matches with a

porthole 250 with an exterior view of space. One or more video cameras 270 view the "action." (The "money" shot is the balls floating in front of a view of Earth.) If there are bandwidth issues, a standard compression technology is used to stream the video in real time. In addition a better quality video is stored and transmitted  
5 after the game is over.

#### Ball Enclosure.

As is the case with an attended game of Sixteen, the purpose of this component is to display the balls and to impart a random motion to them. Therefore it is  
10 transparent. The inside top and side surfaces are uneven, perhaps dimpled. The bottom of the enclosure is composed of sixteen pockets arranged in a four by four grid. At the bottom of each pocket is a hole smaller than the balls. At the start the game air pressure from these holes put the balls into play. The balls bounce off the uneven enclosure and each other to create a random distribution.

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#### End Game.

Both start and end of game events are "synched" to an external time source such as a GPS satellite. Start and end game may be signaled from an external source or pre-determined. For example, the device may be set to start a new game every five  
20 minutes and the game itself to last one minute. At the end of play, air pressure is reversed, so that balls are held into the holes at the bottom of the enclosure through suction. Once all sixteen holes are filled the game is over. A shaker or other device 280, such as muscle wire, shakes the ball enclosure in the event a ball gets stuck.

#### 25 Countdown Timer.

It is important to show when the game ends in such a manner that it is perceived to be fair. One method is to position a count-down timer in view of a camera.

Customers are able to wager on the game remotely by a method such as the  
30 Internet. Additionally, they may be able to wager through devices in casinos, which may be called "Mission Control Gaming Centers". These casino based

Gaming Centers allow unattended wagering on the devices of the present invention. In one embodiment, Earth-based casinos may issue tickets on a scheduled game, such as is done for keno.

5    Space Pool Game

- See FIG. 10. Another embodiment of the invention is a game of chance with a skill component. An example of this type of game is Micro Gravity Three Dimensional Casino Pool, which is called Space Pool for ease of discussion. Again, the goal is to provide a customer an experience unobtainable on earth. For
- 10    this device, a primary goal is to allow a player to play a type of pool in a three-dimensional zero gravity or micro gravity environment. A secondary goal is to provide a means that a gaming operator can make a profit on operating such as device.
- 15    Space Pool is a timed game. Players use an interface to manipulate a robotically-controlled pool cue 580 in the device. The game instructs the player what shot he or she must make to score. That is, it randomly picks a particular ball 505 and a particular hole 510 that the ball must be shot into. The player must then hit a cue ball with the robotic pool cue in such a manner as to accomplish that task. Each
- 20    time a player successfully completes a shot he gets a point. The number of points a player scores in a set time period determines his pay out. In other variations, there are additional rules, such as hitting a certain number of balls while setting up a shot is a disqualification.
- 25    Space pool and other games of skill can be accomplished remotely from Earth via satellite, in a manner similar to that used today when remotely operating undersea robotic diving vehicles from a distance.

- One embodiment of an unattended device to play Space Pool in a micro gravity
- 30    environment is shown in FIG. 10. The device consists of: variously colored balls 505, a transparent enclosure 500 for the balls, multiple "pockets" 510 or targets for

the balls, a means 520 for the balls to affix to or within the pockets, a robotic pool cue 580 controlled by robotic arms 540, 550 and 560, a power source 530, a video camera or cameras 572, 573, a means (not shown) to randomize the balls upon start of play, and a user interface (not shown) for a player to control the robotic pool  
5 cue.

#### Pool Balls.

In one embodiment the balls 505 have a metal core. Hitting a pocket 510 or target turnson an electromagnet 520, therefore affixing the ball to or within the pocket.  
10 This magnet has an effect on the remaining balls, however slight, so in another embodiment once the ball has been captured by an electromagnet, a suction device turns on and the electromagnet turns off, thus minimizing impact on the rest of the balls in play.

#### 15 Enclosure.

The object of the enclosure 500 is to enable a player to make "bank" shots. Therefore a geodesic-type globe may be used. Preferably it is transparent, to allow an exterior camera 572, 573 or live players to watch the action from outside the enclosure.

20

#### Robotic Pool Cue.

Robotic arms are well known in the art. A standard robotic arm 540, 550, 560 with a pool cue tip 580 on the end is adapted for use in zero-G, micro-G and variable-G gaming environments.

25

#### Randomizing.

Before a game is started, jets of compressed air or gas from the pockets randomize the balls.

#### 30 Cameras.

The most important cameras are cameras 570 and 571 mounted to robotic arm 560

and aligned with the robotic pool cue 580 to enable a player to aim. In addition, a camera or cameras 572, 573 that are exterior to the enclosure add to a guest's enjoyment. In another embodiment, a stereoscopic video camera may be mounted aligned with the robotic pool cue. As bandwidth may be an issue, to set up a shot a  
5 player may switch between available cameras. While the game is in play it may be necessary to compress the video. However, when the game is over, a better quality video may be available for a guest to record as a memento of his or her gaming experience.

10 In one embodiment, a thin transparent gel or similar material is housed within the space pool enclosure 500 to provide friction to slow the balls down after hitting, so as to permit a next shot to take place relatively quickly after a shot has occurred.

In another embodiment, an aiming system uses instead of visual cues from a  
15 camera a set of data that allows the player to line up the pool stick as desired, based on the telemetry being received.

In another embodiment, a paddle is used instead of a pool cue.

20 Game Interface.

To identify what pocket is the target pocket, it may be lit, perhaps by LCDs. A method to position the robotic pool cue to shoot is necessary, such as track ball(s). A method to indicate how much motion to move the robotic pool cue may be an actual pool cue with sensors attached, or another method such as a track ball.

25

A game such as Space Pool may be played in three different ways. A player may go to a casino and play in a Space Pool "Mission Control Center." This is an "arcade" quality device, designed both to maximize a player's experience, and also to provide entertainment for onlookers. In addition, the game may be played on-  
30 line, with betting and playing taking place via the Internet.

In order to entice customers to play a game such as Space Pool, it is also available in a "home" (non-betting) version, to enable players to learn and practice playing. This version is a software-based game based on the same physics as the real game.

5 Variable Gravity Gaming in Other than Pure Zero Gravity

For the purposes of this discussion it is assumed that Variable Gravity is produced through a plane flying a Parabolic Flight, such as flights offered by a number of commercial companies and government organizations currently using the Russian IL 76 MDEK Flying Laboratory, the French Airbus, the American KC-135 and  
10 Boeing 727 and other similar aircraft and flight plans. These planes fly a flight pattern consisting of arcs to produce brief time periods of what is commonly referred to as Micro Gravity and brief time periods of gravity levels higher than normal. One skilled in the art understands that there are other ways to produce variable gravity.

15

The minimum variable gravity duration the present invention requires is long enough to run one game of chance. However, technological innovations may soon offer aircraft that fly far higher flight patterns than at the present. These flights paths may produce zero gravity and higher gravity for longer periods of time than  
20 discussed above. This is consistent with the present invention.

One of the pieces of equipment used for training potential astronauts is an aircraft capable of flying in such a way that it can simulate the effects of microgravity, often referred to as weightlessness, for short periods of time. By following a  
25 specific parabolic trajectory in its flight, the aircraft can provide typically 20 to 40 seconds of microgravity on the descending side of the parabolic arc. It does this by descending at the same speed and with the same acceleration that an object has if it were simply dropped. This speed is based on Earth's gravity.

30 Objects (and people) within the aircraft are always feeling the effects of gravity. It is gravity that holds a passenger in his or her seat while a plane is flying with a

level attitude. If the plane is descending with the acceleration as provided by Earth's gravity, there is nothing to hold one in his or her seat. During this period of flight, any object within the plane that is not attached to the plane floats within the cabin.

5

At the end of the descending portion of the parabolic flight, the aircraft must pull out of its dive and climb again to regain altitude. During this phase of flight, the effects of gravity are typically enhanced. Following a curve that is the opposite of the descending curve, the aircraft pushes against its contents with a force of approximately twice Earth's normal gravity. In this phase, a 150-pound person weighs 300 pounds and must be fairly firmly attached to the aircraft.

10

While a parabolic curve that exactly matches the effects of gravity is one flight plan for such an aircraft, it is by no means the only one. By using a shallower curve, the aircraft could simulate the 1/6 G environment of the Moon, or other flight pattern or duplicate other planets' gravity levels.

15

For the purpose of clarity, in the present invention, the plane's flight crew is called the crew; the gaming staff is called the staff; and the players playing games of chance are called the guests. The experience of zero G and the ability to position oneself independent of the aircraft seats, floors, walls, etc. is called "floating."

20

The present invention takes the traditional gaming and casino experience and enhances it, by providing this experience in a variable gravity environment. This requires modification to the traditional experience in three broad categories, namely seating, wagering and security. Traditional casino games can be broken down into four broad categories -- slots, dice games such as craps, number betting games such as roulette, and card games such as Blackjack. For the purposes of this discussion, slots, craps, roulette and blackjack are discussed as examples of the present invention, but the present invention is not limited to these games.

25

30



### Seating

Seating refers to positioning players and staff (game operators and others) in relation to gaming tables and devices. In a variable gravity environment produced by parabolic flight individuals are subject to gravity changes from twice normal  
5 gravity (2Gs) to very little gravity (0Gs). In addition the orientation of gravity with respect to the aircraft and anything bolted to the aircraft changes. In 0G an untethered individual moves with little respect to the aircraft. In level flight or 1G an individual moves normally, that is with gravity in relation to the floor of the plane. In 2Gs an individual moves in relation to the floor and rear of the plane. A  
10 certain amount of padding is necessary for comfort during the 2G portion of parabolic flight.

### Craps and Other Dice Games

In a traditional casino, numerous guests stand on three sides of a craps table, with  
15 staff on the fourth side. In a variable gravity environment this needs to be modified.

One embodiment, discussed above in connection with FIG. 2, is a craps game designed solely for 0G play. Guests are able to experience and wagering on dice,  
20 tumbling in front of them in 0G. A transparent enclosure provides an area for the dice to be rolled. A traditional craps table has one shared area where all guests place their wager. In this embodiment each guest has his or her own position including a method of staying close to his or her own wagering table such as a hand-hold, foot strap, tether, etc. This position could be alongside, over or under  
25 the die enclosure. In the interests of time, since 0G flight is limited, guests may choose or be assigned to various positions before 0G flight.

Another embodiment addresses a craps game adapted for both 0G and 1G flights. The objective for this embodiment is to provide the same thrilling visual of dice  
30 tumbling in a 0G environment while still being able to play craps during 1G flight. The transparent enclosure for throwing of the dice is mounted on a gimbal so that it

remains horizontal with relation to gravity. This allows guests to play even when the plane is in a climb during takeoff. In order to simulate the traditional casino "feel" a staff member faces the rear of the plane, with player positions facing the front of the plane. The die enclosure is between the players and staff. The player  
5 chairs are similar to the blackjack chairs described above, as they may move back during 0G to allow the guest to float free. Before 2G flights the chairs may move forward to allow guests to prepare themselves, in addition the staff chairs turn in the direction of the front of the plane. Play is suspended during 2G flight.

#### 10 Black Jack.

Like many traditional casino games, blackjack is a social game. Players sit on one side of a table while a dealer stands on the other. The dealer distributes cards. To create this experience in a variable gravity some modifications must be made. One embodiment of the present invention follows.

15

The shape of the blackjack table may be changed to a more "kidney" shaped one to enable a seated staff member to access cards and bets in front of a guest. As the chairs required for 2G safety are larger than traditional casino seats the number of guests one staff member can play blackjack with is limited, perhaps three or four  
20 guests per table. In traditional Blackjack cards are dealt in front of guests and the dealer. In order for the cards not to float away during 0G play, some method of containing the cards must be used, such as, inserting the cards into a clear envelope which is affixed to the gaming table, coating one side of the card with Velcro, or applying a magnetic layer to one side. The dealer's cards require a card holder  
25 which can be moved to three positions, 1. no one can see the cards, 2. only the dealer can see the cards, and 3. dealer and guests can see the cards. As discussed above, guests' chairs may move back during 0G to enable the guest to enjoy floating while playing. Before 2G flight commences the dealer chair pivot facing the front of the aircraft and play be suspended until 2G flight is over.

30

Wagering in Zero Gravity, Micro Gravity and Variable Gravity

In a traditional casino, wagering is done with cash and coin, or with casino chips. Placing cash or coin on a table during 0G is problematic or impossible as the guest's money may float away or commingle with another guest's money. During 2G, loose money or chips may be a physical hazard to guests. In light of the above,  
5 the following embodiments of the invention discuss two broad methods of wagering: 1. wagering in a fashion as similar to traditional casinos as possible and 2. methods and systems more adapted for wagering in a variable gravity environment.

#### 10 Modifications to Traditional Casino Wagering.

In the past, and even today, traditional casinos have been deliberately filled with the sounds of slot machines paying off physical coins. At the casino tables, guests stack and fondle their physical chips, and watch theirs and other guests at the table stacks grow and shrink. It is one object of the present invention to simulate  
15 traditional casino gambling. It is another object of the invention to enable cashless live or remote wagering by cards or other means, either real-time or otherwise.

#### Slot Machines.

There are numerous ways a guest adds wagering money to a traditional slot  
20 machine, by inserting coins or tokens, by inserting currency, by letting accumulated money ride, etc. Slot Machine winnings fall into an open hopper to be collected by the guest at his convenience. One embodiment of the present invention follows. As discussed above how a guest adds money to a slot machine does not seem to be a crucial part of the traditional casino experience. Therefore in  
25 one embodiment guests purchase credits from staff before boarding the plane. A guest could then draw on this credit during flight, with a staff member adding or cashing out a guest's credit on a particular slot machine. This embodiment gets rid of coins and tokens entirely as a guest can just set a machine to any winnings "ride", that is cash out at end of play. This has a negative effect on the casino  
30 ambiance, so in this case when the game determines a pay-out situation exists, it plays sound effects of coins hitting a hopper.

There may be guests who enjoy the experience of coins or tokens falling into a hopper and watching their winnings physically accumulate. Another embodiment has some or all of a guest's winnings fall into a partially transparent, sealed container. The slot machine keeps track of the winnings in this sealed container. If the player wished to cash out and/or the container became full, a staff member has an exact count and be able to swap out the full container with an empty one. Additionally, this sealed container may have means to attach a strap, so that guests could carry out their physical winnings at the end of flight.

10

A guest can enjoy slots during their entire time in the casino, through 1G, 0G and 2G flight. One embodiment of the present invention is as follows. A guest sits on a seat designed to be comfortable in both 1G and 2G flight, facing the front of the aircraft. A slot machine is mounted in front of the guest. During 1G flight the seat is within a comfortable reach of the slot machine. Upon entering 0G flight the seat may move away from the slot machine, giving the guest the opportunity experience slots while "floating". A means, such as a handhold, Velcro glove, tether etc. keeps the guest positioned with respect to the slot machine and gives the guest leverage to operate the slot machine interface, such as pulling a handle. When nearing the end 0G flight, the seat moves back into its original position with enough time to give the guest time to be comfortably seated before 2G flight.

15

20

As discussed above, Slot Machine type devices need certain changes to work in a variable gravity environment. For example a closed coin hopper may be provided to contain winnings. In addition, a method, such as forced airflow is required so that winnings move into the hopper during 0G. Card games require a means to hold and view cards. Other than that, few or no modifications are necessary to play card type games in a variable gravity environment. Game devices to play games such as craps and roulette do need modification for a variable gravity environment.

25

Gaming Chips.

30

In traditional casino games chips are placed in various locations on a gaming table to wager. In a variable gravity environment this poses numerous problems. In normal turbulence the chips may be moved from their desired betting location. Chips from various guests may be co-mingled accidentally. During 2G flight chips  
5 may prove to be a physical hazard, perhaps even requiring guests and staff to wear protective gear such as goggles to protect themselves. With these considerations in mind, one embodiment of the present invention follows.

The limited number of guests per flight makes feasible offering each guest their  
10 own personalized chips. Guests may purchase a set number of chips and purchase gambling credit before boarding the plane. The small ratio of staff to guest enables staff to pay off guest winnings with guest-personalized chips. Due to space limitation, the total number of chips per guest may need to be set. If a situation incurs where staff is unable to pay guest winnings due to lack of chips, the guests  
15 chips may be cashed in, that is added to his credit. Similarly a guest may draw down his credit for more chips if he is running low.

The chips have a means of locking to each other and to a game table, such as a simple slot and pin arrangement, Velcro or magnetism. In addition to some  
20 physical means of identification each casino chip may have a memory chip embedded in it, with such information as unique identification number, value, and guest. Additionally each chip may have a lighting device on the top side, such as a LED. When a stack of chips is properly locked together and locked to a table in either a betting or holding location, the light comes on, indicating the chips are  
25 safe. It may also indicate that the casino computer system recognizes the chips and the wager being made. In this system the chips are safely locked down most of the time, except for a brief period when a guest is moving the chips from the holding area to the wagering area.

### 30 Betting Tables

In traditional casinos a common betting table is used for all guests. Using the chips

described above a common betting table is adapted for card games such as blackjack, but not be adapted to games such as craps or roulette. In our discussion above we discussed that guests mobility is limited. The common betting tables for games such as craps or roulette may not be usable by guests who do not have the mobility to place all bets.

For games such as craps and roulette, part of the traditional casino atmosphere is seeing what other guests have bet. Due to the limitations imposed by a variable gravity environment, each guest has his or her own betting seat or station.

Therefore these games may have a visual indication of each guests bets, positioned so all guests can view, such as a large projection television. In games such as craps and roulette there are too many potential bets a guest might make to display them all on a table, in a manner the guest can comfortably reach from a sitting position. For example, there are over 50 unique bets available to a guest playing roulette. In addition, a guest may wish to place more than one bet on a single play.

Therefore each guest has his or her own temporary betting station, with provisions for making multiple bets. The betting station is composed of two parts, a place to put chips and a means to pick which bet is associated with which stack of chips.

For example, there may be four lock downs to place stacks of chips, as described above, each lock down with a unique label. A device to pick a bet might be a touch screen monitor. The touch screen monitor may offer all possible bets for the game. A guest could choose one unique bet by touching the monitor and then lock the bet by a method such as a hard switch by the stack of chips being bet.

25

#### Non-Traditional Casino Wagering.

The above discussion has involved replicating a traditional casino as closely as possible given the constraints of a variable gravity environment. The following discussion involves methods more adapted for a variable gravity environment.

As discussed above, casino chips and coins or tokens could become a hazard to guests and staff during 2G flight and/or during unexpected maneuvering of the

plane. Therefore the following embodiment of the present invention discusses a wagering system which does not use chips, coins or tokens. For the purposes of this discussion we call this a chipless casino.

- 5     Guests can purchase smart cards in a chipless casino. Each smart card has such information as: a unique identification number, guest's name, total value, etc. This smart card may be attached by a method, such as a tether, to the guest. The guest inserts his smart card into any betting station he wants to use and be able to commence gambling. In one embodiment, all betting stations and machines such as  
10   slot machines are tied together in one computer network. This network monitors and record all betting transactions.

Current state-of-the-art slot machines require little modification. A smart card reader could replace a bill acceptor. Any winnings are added to a guest's account  
15   electronically.

#### Wagering.

- There are two components to making a wager on a table game, such as blackjack, roulette and craps; the wager amount and the wager type. A guest puts chips in a  
20   betting area, casino staff monitor the bets and an overhead camera records the transaction. In a chipless casino, especially in a variable gravity environment, a guest may inadvertently make a mistake, or a guest may try to take advantage of the casino and claim a mistake. In light of this we discuss two broad categories of means to select a wager amount in a chipless casino. One embodiment uses  
25   mechanical means for a guest to place a wager and wager amount. Another embodiment uses electronic means for a guest to place a wager and wager amount.

#### Mechanical Wagering.

- In a traditional casino every betting table has a minimum and maximum bet.  
30   Therefore it is not likely to impact the casino experience by restricting guests in the same manner in a variable gravity casino. To explain a mechanical means for a

guest to place a wager and wager amount we discuss it with reference to blackjack and roulette, however one skilled in the art will recognize that this embodiment works similarly with other casino table games.

- 5 As discussed above, each guest has his or her own betting station, including a means to enter an amount of wager and type of wager. Before the start of a new blackjack game, each guest participating must place a wager amount. In this system the guest may have four large buttons, each button indicating a different wagering amount, for example \$50, \$100, \$500 and \$1,000. Only one button can
- 10 be depressed at one time. Before starting a new game the dealer confirms that bets are keyed in and activates a switch to lock the wager amount down. A method of showing the guest the amount wagered is desirable, this could be as simple as an LCD panel on the betting station.
- 15 In blackjack, there are three additional types of bets possible once play has begun, doubling down, splitting and insurance. The amount of these bets is determined by the initial bet. Doubling down and splitting are the same amount as the initial bet while insurance is one-half the initial bet. Insurance is very straight forward, when a dealer's up card is an ace, a guest can bet insurance, that is place an additional bet
- 20 that the dealer is going to have a face card on the hidden card or blackjack. Betting insurance could be done with another button similar to above. Splitting and doubling down both require dealer intervention. Therefore it is advantageous for the dealer to key in these bets for a better game flow.
- 25 The total bet on a hand is displayed before the guest. However, with splitting, this total wager does not indicate what is being bet on a particular hand. Therefore the display indicates total wager on each hand and total wager on the round of play. In another embodiment, the amount wagered on a hand could be displayed on the game table by a method such as an LCD display. As discussed above, blackjack is a
- 30 social game and so it is advantageous to have a large display that all guests at a table could view showing guest's current wager and results of a round of play.



Games such as roulette do not have additional bets once play commences but do allow multiple bets of varying amounts for each round of play. In another embodiment of the present invention, buttons are used to determine the amount of the wager as discussed above, however there may be multiple sets of wagering buttons associated with a method to pick a wager type. For example, there may be four rows of buttons. Each row is associated with a wager type, so row one may be labeled bet one, row two may be labeled bet two, etc. As there are over 50 different types of wagers in roulette, using a button system for wager type may be possible but cumbersome. In one embodiment of the present invention, wager type is selected by a user interface, such as a touch pad video screen. The wager type and wager amount can then be shown to the guest in some manner such as an LCD screen. When the guest sees a wager amount and wager type associated on the LCD screen, he or she then press an OK button associated with a row as discussed above. These buttons are locked before the game starts.

#### Electronic Wagering.

Another embodiment of the present invention is electronic wagering, namely choosing a wager amount and wager type by some interface such as a touch screen display. This method has the advantage of being very flexible, as the display can change as the game progresses. The display may even change based on the guest's past betting behavior. For instance if a guest never bets individual numbers when playing roulette, that selection may be given less emphasis in the user interface. The disadvantage of this system is that there is more chance for a guest to accidentally make an incorrect selection.

One method to ensure a guest did not make a larger wager than he wanted is to put a lock on the maximum wager amount. This could be set when the guest purchased his smart card or settable by casino staff. Another method is to have the guest verify his bet just before the game commenced. For example the results of a guest's wager type and wager amounts could be shown on a display, such as a LCD

display. Before the game started the guest may have to ok the bet on his touch screen display, by pushing a separate button or by giving a verbal ok to the dealer, which is recorded on videotape.

## 5 Off-Site Wagering

There is a need for constant novelty in games of chance. That makes wagering on games of chance conducted in a variable gravity environment exciting to potential players. However, as not all potential players have the resources to get to a variable gravity casino in person, it is helpful to provide these individuals with a means to  
10 bet on a game of chance that is conducted in a variable gravity environment from a remote location. There are three broad components of off-site wagering: a game of chance, a method of wagering, and security.

Traditional casinos have off-site wagering on sports events such as football games  
15 and horse races. Guests purchase tickets for this off site wagering from a staff member. Additionally, the current state of the art enables guests to purchase off site wagers from an unattended machine. Guests who wager on off site games of chance may or may not desire to watch the game in real time and/or view the results at a later time, via video or other viewing technologies.

20 Video bandwidth may be an issue when creating variable gravity using a plane flying a parabolic flight path. Therefore it is recommended that for a live presentation of a lottery type game a standard video compression system be used. An additional consideration is getting the video from the plane to a base station  
25 where it can be distributed, in real time. In one embodiment, the plane flies a flight path that enables it to create a 0G environment and enables communications with a communication satellite. While this video is adequate for guests who want results in real time, it may not be adequate for guests who desire to view results at a later time.

30 Communications downlinks may, but need not, be via the Internet. Dedicated dial-

in servers are used in an alternative embodiment. In another embodiment, dedicated lines are used from a mission control of the invention to other locations.

State run lotteries typically have a show for their television customers. This may  
5 include a host, multiple camera angles, close-ups of the randomizing chamber, and  
close-ups of the winning picks. This show may be on a custom set. In one  
embodiment of the invention a show of this type may be made using known state  
of the art methods. Video may be stored on a media and then taken to a base  
station for editing and/or distribution upon the plane landing. Once the show has  
10 been edited and distributed it is available for viewing. It could be displayed in a  
casino such as other games of chance are, it could be viewed over the internet or it  
may be able to be viewed on an unattended lottery vending machine.

#### Off-Site Games of Chance

15 The goal of an off-site game is to present an exciting display to encourage people  
to play it. Games such as keno, roulette and lottery type games are very adaptable  
to zero-G and variable-G environments, as well as others. In addition games such  
as Byte and Sixteen that has been discussed above are well adapted for off-site  
wagering.

20

#### Virtual Gaming.

In another embodiment of the invention, actual gaming devices need not be  
physically present in an actual zero-G or variable-G environment. Instead, the  
entire gaming environment and experiences may be completely simulated via an  
25 Internet Web site. A server or other computer under the control of game playing  
software generates and operates simulated games of chance for players located at  
remote terminals who have logged onto an Internet gaming service.

For example, in a virtual game of craps, as simulated game objects such as dice are  
30 "thrown" in a simulated zero-G environment, physics modeling software running  
at the Web site computes simulated motion for the dice as the dice "bounce"

around a simulated enclosed container. Wagers may be placed via the Internet using either actual electronic funds or "play money." After the passage of a short time, a simulated end-of-game event is commenced, and the simulated dice are urged into a randomized resting position by a simulated electromagnetic field or application of simulated air jets or vacuum. Images of the dice, ending dice position, the game board and the winning and losing bets of all the players are sent continuously or periodically to all players who have logged onto the site and have registered to play this particular game.

#### 10 Security For Zero-G And Variable-G Games

The largest security concern with off site wagering is ensuring that wagering is not allowed after the game has started. The first step is for the plane or space vehicle to communicate in some manner with the off site wagering locations when the game is about to start, to stop wagering on the current game. In addition, a means must exist that allows a casino owner to monitor that tickets were not issued after a game has commenced. This requires both the plane and off site wagering facility to be in synch time wise. This could be done by utilizing a time channel on a satellite, such as GE-1.

20 In a traditional casino security is a very important and expensive facet of operations. The system and methods discussed above remove a lot of security concerns such as commingling of funds and stealing funds. In a variable gravity casino security issues are concerned with two broad areas: illegal guest manipulation of casino equipment, such as rigging dice and, collusion between staff and guests.

#### Security Against Manipulation of Casino Equipment.

##### Slot Machines.

In traditional casinos slot machine manipulation is usually done in a "smash and grab" fashion. That is extracting an unearned pay-off from a machine and then leaving the casino before it is discovered. Security for slot machine type games is

the same in a variable gravity casino as in a traditional casino, video cameras.

#### Security for Craps and other Dice-type Games.

Guest manipulation of devices such as dice has been going on as long as there has  
5 been gambling. In the present invention, the dice used during a flight may be  
differently colored, perhaps selected at random, to make substitution more  
difficult. Additionally, the dice used on a flight may be of slightly different weights  
to make substitution even more difficult. In a traditional casino video cameras are  
mounted in the ceiling to monitor guests and staff. In a variable gravity casino  
10 cameras must be mounted with relation to the freedom of movement available to a  
guest during 0G flight.

#### Security for Card Games.

As discussed above cards must be physically constrained so that they do not move  
15 during flight. That is the guest never actually touches the cards.

#### Security Against Collusion Between Staff and Guests.

As discussed above, all variable gravity machines may be linked together and a  
digital record kept of all gaming activities. In the long run, analysis of guest's  
20 winnings associated with various staff may show patterns of collusion. Switching  
dice is always a problem in a casino, but having a staff manager randomly remove  
dice from play and verify them according to the above discussion makes this more  
difficult.

25 The biggest security hole in variable gravity casinos comes from card games and  
the ability of a staff member to manipulate the deal to benefit a particular guest. A  
device that continuously shuffles and monitors cards may be used. This and similar  
devices and methods ensure the proper card is dealt.

30 The remaining security hole is a dealer making a mathematical error, either  
accidentally or on purpose, to benefit a particular guest. As discussed above, cards

have to be inserted into holders due to the variable gravity environment. In one embodiment of the present invention, each card holder may have a scanner of some sort, such as a bar code reader. Each card has a unique identification, such as a bar code. As discussed above all games may be connected to a central computer. With  
5 card games the dealer declares a winner through an interface such as a touch screen monitor. In this embodiment the central computer has all information about a particular game and is able to override or call for a staff manager if a dealer makes an error.

10